Operator Manual

Cummins **Onan**

Performance you rely on.™

Generator Set

HDKAW (Spec A)

English 11–2009 A026M828 (Issue 3)

California

Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

⚠ WARNING ⚠

Do not use this genset on a boat
Such use may violate U. S. Coast Guard regulations and can result in severe personal injury or death from fire, electrocution, or carbon monoxide poisoning

Table of Contents

SECTION	PAGE
Table of Contents	i
SAFETY PRECAUTIONS	iii
1. INTRODUCTION	1-1
About this Manual	1-1
Nameplate	1-1
How to Obtain Service	1-2
Engine Emissions Compliance	1-2
Typical Genset	1-3
2. OPERATION	2-1
Fuel Recommendations	2-1
Engine Oil Recommendations	2-1
Coolant Recommendations	2-2
Starting Batteries	2-2
Control Panel	2-2
Remote Control Panel	2-2
Pre-Start Checks	2-3
Priming the Fuel System	2-3
Manual Starting	2-4
Manual Stopping	2-4
Automatic Starting and Stopping	2-4
Loading the Genset	2-4
Resetting Circuit Breakers	2-5
Connecting to Utility Power	2-5
Operating in Cold Weather	2-5
Operating in Hot Weather	2-6
Operating at High Altitude	2-6
Operating in Dusty Environments	2-6
Breaking In a New Engine	2-6
Exercising the Genset	2-6
Storing the Genset	2-6

SECTION **PAGE**

3. PERIODIC MAINTENANCE 3-1
- General Inspection 3-2
- Checking Engine Oil Level 3-2
- Changing Engine Oil and Oil Filter 3-3
- Maintaining the Battery and Battery Connections 3-4
- Replacing the Air Filter Element 3-4
- Cleaning the Spark Arrestor 3-5
- Draining/Replacing the Fuel Filter 3-6
- Maintaining the Engine Cooling System 3-7

4. TROUBLESHOOTING 4-1
- Troubleshooting With Table 4-1 4-1
- Fault Code Blinking 4-1
- Restoring Fault Code Blinking 4-1

5. SPECIFICATIONS 5-1

6. MAINTENANCE RECORD 6-1

SAFETY PRECAUTIONS

Thoroughly read the OPERATOR'S MANUAL before operating the genset. Safe operation and top performance can only be obtained when equipment is properly operated and maintained.

The following symbols in this manual alert you to potential hazards to the operator, service person and equipment.

⚠ DANGER ***alerts you to an immediate hazard that will result in severe personal injury or death.***

⚠ WARNING ***alerts you to a hazard or unsafe practice that can result in severe personal injury or death.***

⚠ CAUTION ***alerts you to a hazard or unsafe practice that can result in personal injury or equipment damage.***

Electricity, fuel, exhaust, moving parts and batteries present hazards which can result in severe personal injury or death.

When equipped with an integral or add-on Automatic Generator Starting System (AGS) control, exhaust carbon monoxide (CO), electric shock, and moving parts hazards are possible due to unexpected starting. Turn off AGS whenever performing maintenance or service, when the vehicle is stored between uses, is awaiting service, or is parked in a garage or other confined area.

ENGINE EXHAUST IS DEADLY

- Inspect for exhaust leaks at every startup and after every eight hours of running.
- Learn the symptoms of carbon monoxide poisoning in the genset Operator's Manual.
- Never sleep in the vehicle while the genset is running unless the vehicle is equipped with a working carbon monoxide detector.
- Do not operate the genset when the vehicle is parked in a confined space, such as a garage.
- Disable the automatic genset starting feature (AGS) of an inverter-charger or other automatic starting device before storing the vehicle or parking it in a garage or other confined space.
- The exhaust system must be installed in accordance with the genset Installation Manual.
- Engine cooling air must not be used for heating the vehicle.

GENERATOR VOLTAGE IS DEADLY

- Disable the automatic genset starting feature (AGS) of an inverter-charger or other automatic starting device before servicing the genset to avoid electric shock from an unexpected start.
- Generator electrical output connections must be made by a trained and experienced electrician in accordance with applicable codes.
- The genset must not be connected to shore power (utility). Back-feed to shore power can cause electrocution and damage to equipment. An approved switching device must be used to prevent interconnections.
- Use caution when working on live electrical equipment. Remove jewelry, make sure clothing and shoes are dry, stand on a dry wooden platform or rubber insulating mat and use tools with insulated handles.

DIESEL FUEL IS COMBUSTIBLE

- Do not smoke or turn electrical switches ON or OFF where fuel fumes are present or in areas sharing ventilation with fuel tanks or equipment. Keep flames, sparks, pilot lights, arc-producing equipment and all other sources of ignition well away.
- Fuel lines must be secured, free of leaks and separated or shielded from electrical wiring.

MOVING PARTS CAN CAUSE SEVERE PERSONAL INJURY OR DEATH

- Disable the automatic genset starting feature (AGS) of an inverter-charger or other automatic starting device before servicing the genset to avoid unexpected starting.
- Do not wear loose clothing or jewelry near moving parts such as PTO shafts, fans, belts and pulleys.
- Keep hands away from moving parts.
- Keep guards in place over fans, belts, pulleys, and other moving parts.

BATTERY GAS IS EXPLOSIVE

- Wear safety glasses.
- Do not smoke near the batteries or near the generator set.
- To reduce arcing when disconnecting or reconnecting battery cables, always disconnect the negative (–) battery cable first and reconnect it last.

FLAMMABLE VAPOR CAN CAUSE A DIESEL ENGINE TO OVERSPEED

Flammable vapor can cause a diesel engine to overspeed and become difficult to stop, resulting in possible fire, explosion, severe personal injury and death. ***Do not operate a diesel-powered genset where a flammable vapor environment can be created by fuel spill, leak, etc.*** The owners and operators of the genset are solely responsible for operating the genset safely.

GENERAL PRECAUTIONS

- To prevent equipment damage or personal injury, do not store items in the clearance area around the generator set, especially near the belt guard end of the generator set.
- Keep children away from the genset.
- Do not use evaporative starting fluids. They are highly explosive.
- To prevent accidental or remote starting while working on the genset, disconnect the negative (–) battery cable at the battery.
- Let the engine cool down before removing the coolant pressure cap or opening the coolant drain. Hot coolant under pressure can spray out and cause severe burns.
- Keep the genset and its compartment clean. Excess oil and oily rags can catch fire. Dirt and gear stowed in the compartment can restrict cooling air.
- Make sure all fasteners are secure and torqued properly.
- Do not work on the genset when mentally or physically fatigued or after consuming alcohol or drugs.
- You must be trained and experienced to make adjustments while the genset is running—hot, moving or electrically live parts can cause severe personal injury or death.
- Used engine oil has been identified by some U. S. state and federal agencies as causing cancer or reproductive toxicity. Do not ingest, inhale, or contact used oil or its vapors.
- Ethylene glycol, used as engine antifreeze, is toxic to humans and animals. Clean up spills and dispose of used engine coolant in accordance with local environmental regulations.
- Keep multi-class ABC fire extinguishers readily at hand. Class A fires involve ordinary combustible materials such as wood and cloth. Class B fires involve combustible and flammable liquids and gaseous fuels. Class C fires involve live electrical equipment. See NFPA No. 10 or equivalent—BS EN 3-7:2004 [Portable Fire Extinguishers].
- Genset installation and operation must comply with all applicable local, state and federal codes and regulations.

Mobile-8

1. Introduction

ABOUT THIS MANUAL

This is the Operator's Manual for the generator sets (gensets) listed on the front cover. Read and carefully observe all of the instructions and precautions in this manual. Keep this manual and the genset Installation Manual with the other vehicle manuals.

Operation, Periodic Maintenance and *Troubleshooting* provide the instructions necessary for operating the genset and maintaining top performance. The owner is responsible for performing maintenance in accordance with the PERIODIC MAINTENANCE SCHEDULE (p. 3-1).

⚠WARNING ***This genset is not a life support system. It can stop without warning. Children, persons with physical or mental limitations, and pets could suffer personal injury or death. A personal attendant, redundant power or alarm system must be used if genset operation is critical.***

⚠WARNING ***Improper service or replacement of parts can lead to severe personal injury or death and to damage to equipment and property. Service personnel must be qualified to perform electrical and mechanical service.***

Unauthorized modifications or replacement of fuel, exhaust, air intake or speed control system components that affect engine emissions are prohibited by law in the State of California.

NAMEPLATE

Be ready to provide the genset model and serial numbers on the nameplate when contacting Cummins Onan for parts, service or information. Figure 1-1 illustrates the nameplate and its location. The gray boxes illustrate where to look for the model and serial numbers.

Record these numbers in Figure 1-2 so that they are easy to find when needed. Each character in these numbers is significant. The last character of the model number is the specification letter, which is important for obtaining the right parts. Genuine Cummins Onan replacement parts are recommended for best results. Refer to the genset Parts Catalog.

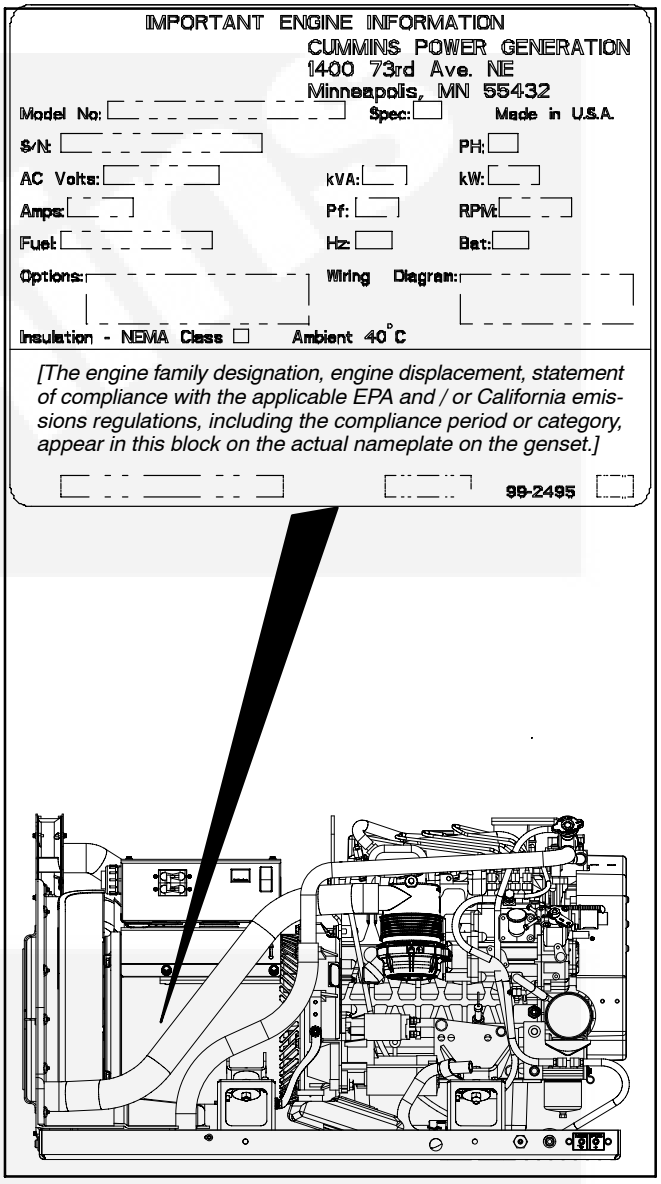

FIGURE 1-1. TYPICAL NAMEPLATE

MODEL NUMBER: _____

SERIAL NUMBER: _____

FIGURE 1-2. RECORD NUMBERS HERE

HOW TO OBTAIN SERVICE

When you call for service, parts, or product literature (such as the Service Manual or Parts Catalog) for your genset, contact the nearest authorized Cummins Onan distributor. Cummins Onan has factory-trained representatives to handle your requests for genset parts and service. For information for contacting our distributors worldwide, go to internet site ***www.cumminsonan.com***.

In North America

Call 1-800-888-ONAN to contact the nearest Cummins Onan distributor in the United States or Canada. (This automated service utilizes touch-tone phones only). Select OPTION 1 (press 1) to be automatically connected to the distributor nearest to you.

If you are unable to contact a distributor using the automated service, consult the Yellow Pages. Typically, our distributors are listed under:

GENERATORS – ELECTRIC,
ENGINES – GASOLINE OR DIESEL, or
RECREATIONAL VEHICLES – EQUIPMENT, PARTS AND SERVICE.

If you have difficulty in arranging service or resolving a problem, please contact the Service Manager at the nearest Cummins Onan distributor for assistance.

Outside North America

If you are outside North America, call Cummins Power Generation at 1–763–574–5000 from 7:30 AM to 4:00 PM, Central Standard Time, Monday through Friday, or fax 1–763–528–7229.

Information to Have Ready

Before calling for service, have the following information available:

1. *The complete genset model number and serial number. See the nameplate..*
2. *The date of purchase.*
3. *The nature of the problem. See Section 4. Troubleshooting.*

ENGINE EMISSIONS COMPLIANCE

The label that states compliance with applicable engine emissions regulations is located on the side wall of the base pan, as shown circled in Figure 1-3. Refer also to the FEDERAL EMISSION DESIGN AND DEFECT LIMITED WARRANTY FOR C. I. ENGINES (DIESELS) that was shipped in the same package as the Operator's Manual.

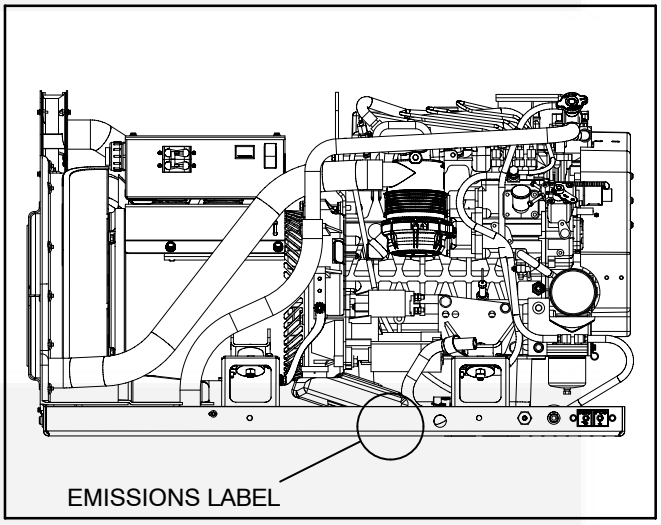

FIGURE 1-3. EMISSIONS LABEL LOCATION

TYPICAL GENSET

Figures 1-4 and 1-5 illustrate the location of key operating features such as the fuel and battery connection points, control panel switches, hour meter, the coolant and oil fill locations, and other operating component locations.

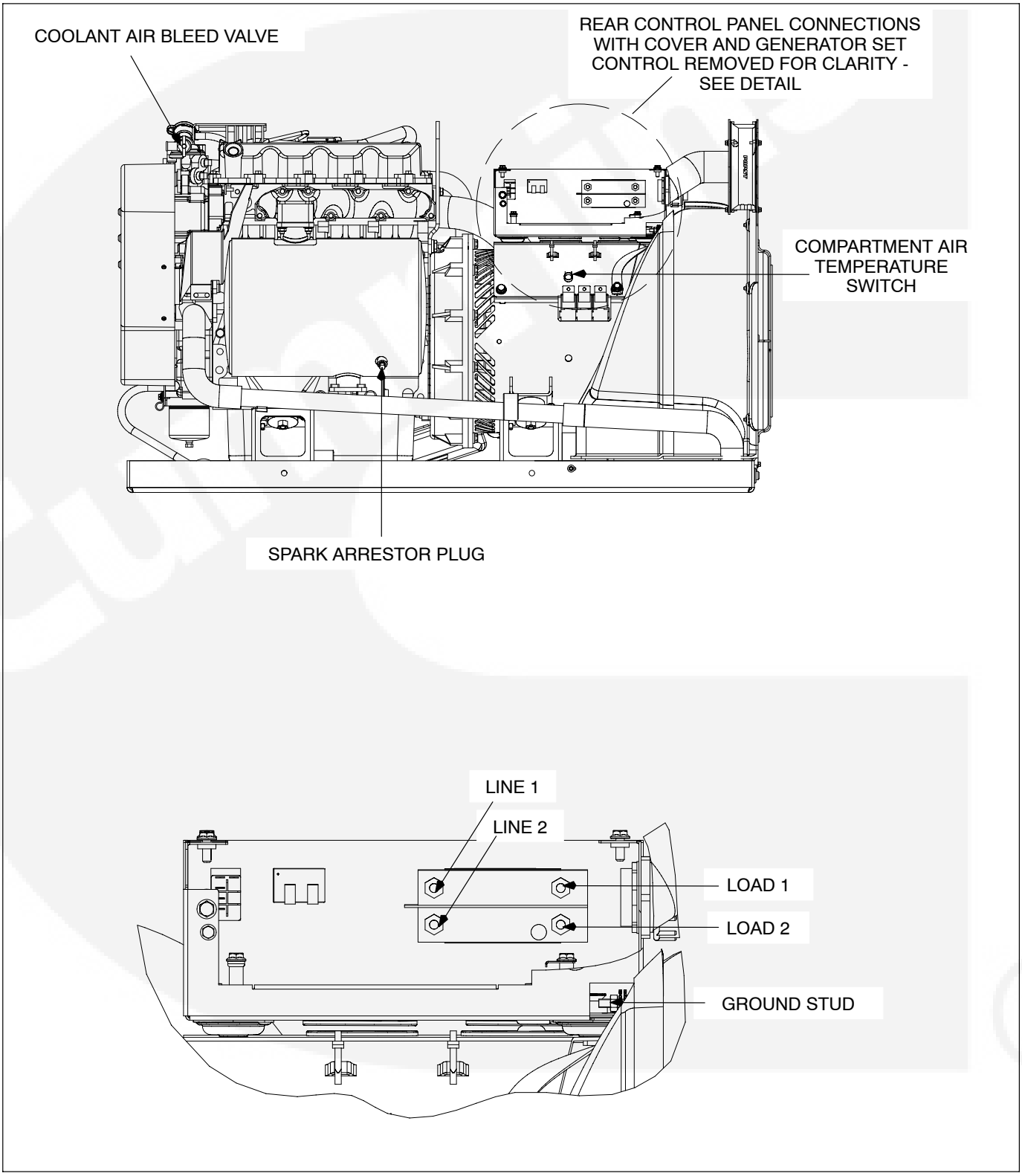
COOLANT AIR BLEED VALVE
REAR CONTROL PANEL CONNECTIONS WITH COVER AND GENERATOR SET CONTROL REMOVED FOR CLARITY - SEE DETAIL
COMPARTMENT AIR TEMPERATURE SWITCH
SPARK ARRESTOR PLUG
LINE 1
LINE 2
LOAD 1
LOAD 2
GROUND STUD

FIGURE 1-4. TYPICAL GENSET

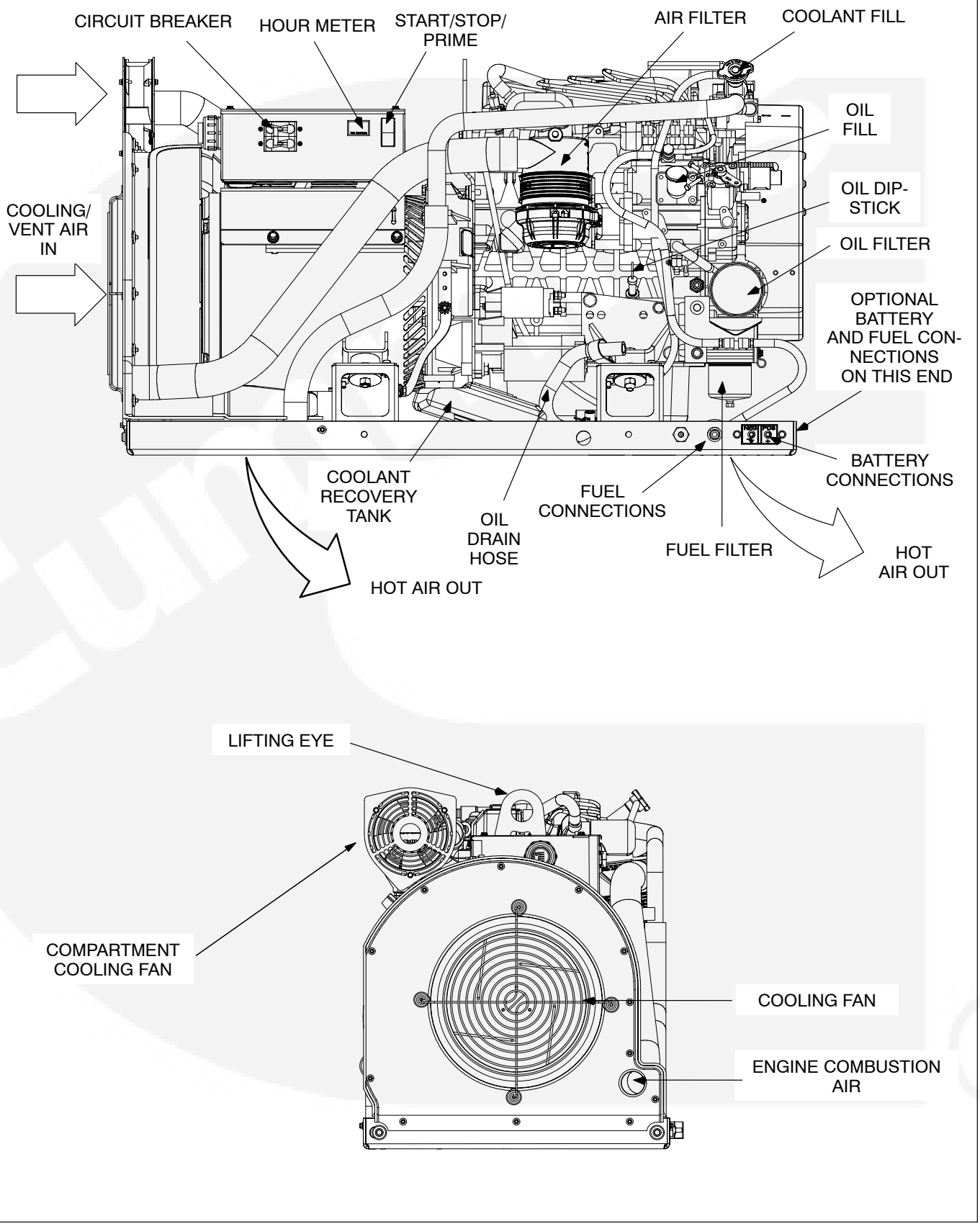

FIGURE 1-5. GENSET COMPONENT LOCATIONS

2. Operation

FUEL RECOMMENDATIONS

⚠WARNING ***Diesel fuel is combustible and can cause severe personal injury or death. Do not smoke near fuel tanks or fuel-burning equipment or in areas sharing ventilation with such equipment. Keep flames, sparks, pilot flames, electrical arcs and switches and all other sources of ignition well away. Keep a multi-class ABC fire extinguisher handy.***

High quality diesel fuel is necessary for good performance and long engine life.

- The specifications for the type and sulfur content (ppm, % weight) of the diesel fuel used must comply with all emissions regulations applicable in the areas where the genset is to be operated.
- Diesel fuels meeting ASTM D975 or EN 590 specifications are recommended. Use Grade 1-D diesel fuel where ambient temperatures are below 14° F (–10° C). A minimum Fuel Cetane Rating of 45 is recommended. Where ambient temperatures are below –4° F (–20° C), or the elevation is above 5000 ft (1500 m), a minimum Cetane Rating of 50 is recommended.
- Current US EPA regulations for Non-Road engines limit diesel fuel sulfur content to a maximum of 500 ppm (0.05% weight). Therefore, use Grade 2-D S500 or 2-D S15 diesel fuel. Where ambient temperatures are below 14° F (–10° C), use Grade 1-D S500 or 1-D S15 diesel fuel. Note that beginning in year 2010, US EPA regulations for Non-Road engines will limit diesel fuel sulfur content to a maximum of 15 ppm (0.0015% weight).
- Do not use diesel fuel having a sulfur content greater than 10,000 ppm (1.0% weight).
- Diesel fuel must meet the ASTM D975 standard for lubricity and pass a minimum load level of 3100 grams as measured by ASTM D6078, or maximum scar diameter of 0.45 mm as measured by ASTM D6079 or ISO 12156–1.
- B20 Bio-Diesel fuel that meets industry specifications and quality is suitable for use with this genset.

ENGINE OIL RECOMMENDATIONS

Oil Performance Class

Use API (American Petroleum Institute) classified engine oils according to the following guidelines:

- **Emissions-Regulated Areas:** It is mandatory to use CF, CF–4, CG–4, CH–4 or CI–4 class oil with low sulfur fuel (sulfur content less than 500 ppm, 0.05% weight) or ultra low sulfur fuel (sulfur content less than 15 ppm, 0.0015% weight).
- **Non-Regulated Areas:** CF class oil is recommended when using high sulfur fuel—sulfur content between 500 ppm (0.05% weight) and 5000 ppm (0.5%weight). If CF–4, CG–4, CH–4 or CI–4 class oil is used, the oil and oil filter must be changed twice as often as specified in the PERIODIC MAINTENANCE SCHEDULE (Page 3-1).
- **Non-Regulated Areas:** Use CF, CF–4, CG–4, CH–4 or CI–4 class oil when using high sulfur fuel—sulfur content between 5000 ppm (0.5% weight) and 10,000 ppm (1.0% weight). The oil and oil filter must be changed twice as often as specified in the PERIODIC MAINTENANCE SCHEDULE (Page 3-1).

Oil Viscosity

Look for the SAE (Society of Automotive Engineers) viscosity grade. Referring to Figure 2-1, choose the viscosity grade appropriate for the ambient temperatures expected until the next scheduled oil change. Multi-grade oils such as SAE 15W-40 are recommended for year-round use.

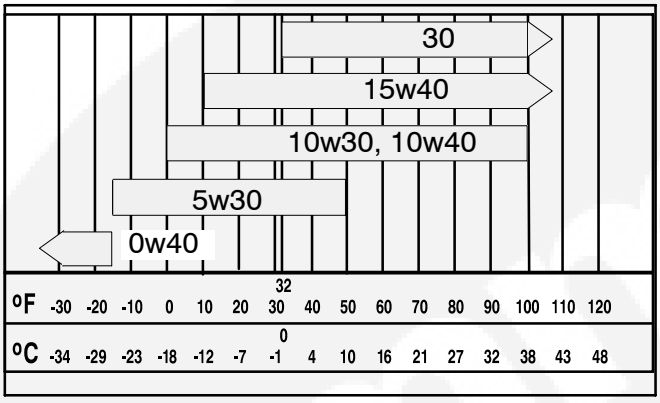

FIGURE 2-1. OIL VISCOSITY VS. TEMPERATURE

COOLANT RECOMMENDATIONS

Use the best quality ethylene glycol antifreeze solution available. It should be fully formulated with rust inhibitors and coolant stabilizers and mixed with fresh (distilled) water that is low in minerals and corrosive chemicals. A 50/50 mixture is recommended for all climates and is suitable for temperatures down to -34° F (-37° C).

See *Section 5. Specifications* for coolant capacity.

Coolant Recovery Tank Fill Cap – The recovery tank provides for coolant expansion. Replenish the normal loss of coolant by filling here.

STARTING BATTERIES

The genset requires a 12 volt battery to power its control and starting circuits. Reliable genset starting and starter service life depend upon adequate battery system capacity and maintenance.

See MAINTAINING THE BATTERY AND BATTERY CONNECTIONS (p. 3-4) and *Section 5. Specifications* for minimum required battery ratings.

CONTROL PANEL

The control panel (Figure 2-2) has the following features:

Control Switch – This switch is used to start and stop the genset, prime the engine fuel system and restore the fault code (blinking status light).

Status Lamp – This is a lamp in the control switch that blinks rapidly during preheat and cranking. It stays on continuously while the genset is running. If the genset shuts down, it will blink a numerical code to indicate the nature of the fault shutdown (see *Section 4. Troubleshooting*).

(Rapid blinking before cranking starts indicates that the glow plugs are preheating the combustion chambers. The genset controller automatically varies the time based on engine temperature.)

Line Circuit Breaker(s) – The line circuit breakers protect the AC power leads connected to the genset.

Hour Meter – The hour meter records the total running time of the genset. It cannot be reset.

REMOTE CONTROL PANEL

A remote genset control panel can be installed inside the vehicle. Three control panel kits are available:

- Remote switch / status lamp
- Remote switch / status lamp and hour meter
- Remote switch / status lamp and DC voltmeter

The DC voltmeter indicates whether voltage across the 12 VDC control system and battery is normal. If the indicator consistently stays above or below the normal zone, see MAINTAINING THE BATTERY AND BATTERY CONNECTIONS (p. 3-4).

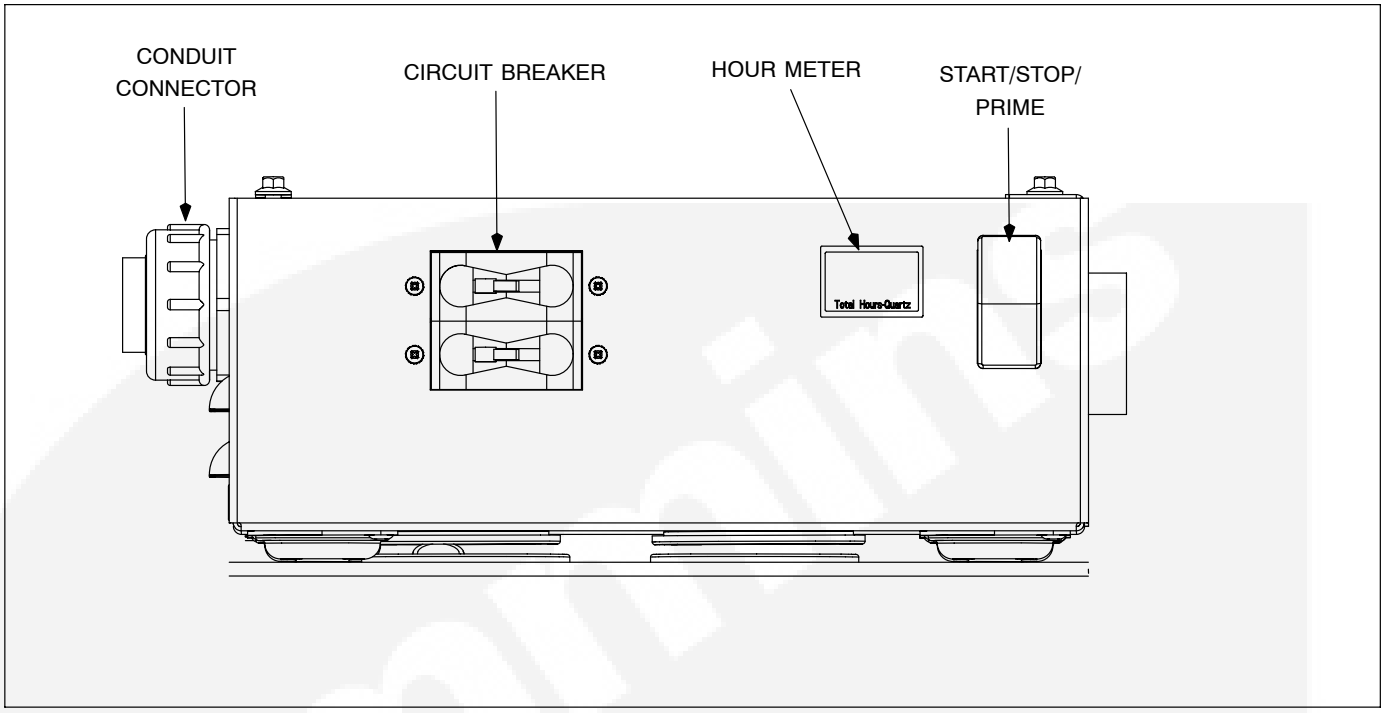

FIGURE 2-2. CONTROL PANEL

⚠WARNING ***EXHAUST GAS is deadly. All engine exhaust contains carbon monoxide; an odorless, colorless, poisonous gas that can cause unconsciousness and death. Symptoms of carbon monoxide poisoning include:***

- ***Dizziness***
- ***Headache***
- ***Nausea***
- ***Weakness and Sleepiness***
- ***Vomiting***
- ***Inability to Think Coherently***

IF YOU EXPERIENCE ANY OF THESE SYMPTOMS, GET INTO FRESH AIR IMMEDIATELY. If symptoms persist, seek medical attention. Shut down the genset and do not operate it until it has been inspected and repaired.

Never sleep in the vehicle while the genset is running unless the vehicle has a working carbon monoxide detector. The exhaust system must be installed in accordance with the genset Installation Manual. Make sure there is ample fresh air when operating the genset in a confined area.

PRE-START CHECKS

Before the first start of the day and after every eight hours of operation, inspect the genset as instructed under GENERAL INSPECTION (p. 3-2). Keep a log of maintenance and the hours run and perform any maintenance that may be due. See Returning the Genset to Service (p. 2-6) if the vehicle has been in storage.

Before each start:

1. Make sure all vehicle carbon monoxide (CO) detectors are working.
2. Check for fuel, oil and coolant leaks and damage to the exhaust system.
3. To prevent overheating and to reduce fouling with dust and debris, make sure the genset's normal ground clearance is not reduced by sloping ground, curbs, logs or other objects. Repark the vehicle if necessary and/or remove any objects blocking the air inlet or air outlet.
4. Turn off air conditioners and other large appliances.
5. Make sure that nothing is stored in the area around the generator set, and make sure that nothing is interfering with generator set operation.

PRIMING THE FUEL SYSTEM

The fuel system should be primed after replacing the fuel filter or running the genset out of fuel. To prime the fuel system, hold the control switch down in its **Stop** position for at least half a minute. (Shutdown Code No. 57, Overprime, occurs after 3 minutes of holding the switch down. See *Section 4. Troubleshooting.*)

MANUAL STARTING

The genset can be started and stopped from the genset control panel or from a remote panel.

1. Perform the PRE-START CHECKS, prime the fuel system if necessary, and turn off the air conditioners and other large electrical loads.
2. Push and hold **Start** until the genset starts. The status lamp will come on when the genset starts and will stay on while it runs. While starting it will blink rapidly indicating preheating and cranking. (Depending on how cold it is, preheating can take up to 15 seconds, extending the time that the lamp blinks.)

   ⚠CAUTION ***Excessive cranking can overheat and damage the starter motor. Do not crank for more than 30 seconds at a time. Wait at least 2 minutes before trying again.***
3. See *Section 4. Troubleshooting* if the genset does not start after several tries.
4. Let the genset warm up for a few minutes until it is running smoothly before connecting the vehicle electrical loads (appliances).
5. Check for fuel, oil, coolant and exhaust leaks. Stop the genset immediately if there is a leak and have it repaired.

MANUAL STOPPING

Run the genset under no load for a few minutes to allow the engine to cool down and then push and release **Stop**.

AUTOMATIC STARTING AND STOPPING

The vehicle may be equipped with an inverter-charger or other automatic genset starting device (AGS). Always follow the instructions and safety precautions provided by the manufacturer of the automatic starting device when enabling automatic genset starting.

⚠WARNING ***EXHAUST GAS is deadly. MOVING PARTS and ELECTRICITY can cause severe personal injury or death. To reduce exposure to these hazards, always disable automatic genset starting before:***

- ***Sleeping in vehicle, unless vehicle has a working CARBON MONOXIDE detector***
- ***Parking vehicle in garage or confined space***
- ***Parking vehicle for storage***
- ***Servicing genset***
- ***Servicing batteries***
- ***Servicing electrical appliances***
- ***Fueling vehicle***

LOADING THE GENSET

The genset can power AC motors, air conditioners, AC/DC converters, battery chargers and other appliances. How much appliance load* can be powered depends upon the genset power rating. The genset will shut down or its circuit breakers will trip if the sum of the loads exceeds the rated genset power. See *Section 4. Troubleshooting*.

To avoid overloading the genset and causing shutdowns, compare the sum of the loads of the appliances that are likely to be used at the same time to the power rating of the genset. ***It may be necessary to run fewer appliances at the same time—the sum of the loads must not be greater than genset power rating.***

The genset may shut down due to overload when a large motor or air conditioner is started or cycles off and then on again, even though the sum of the loads is less than the genset rating. The reason for this is that a motor's startup load is much larger than its running load. ***It may be necessary to run fewer appliances when large motors and air conditioners are cycling on and off.***

Maximum power decreases as altitude increases because air density decreases. Maximum power also decreases as ambient temperature increases. For every 1000-foot (305 m) increase in elevation, expect the power to decrease approximately 3.5 percent. For every 10° F (5.5° C) increase in ambient temperature above 85° F (29.4° C), expect the power to decrease approximately 1 percent. See Table 2-1. ***It may be necessary to run fewer appliances at higher altitudes.***

* Appliance load and genset power are measured in terms of watts (W) or kilowatts (kW), where 1 kilowatt (kW) = 1000 watts (W).

TABLE 2-1. POWER VS. ALTITUDE

Altitude (Elevation above Sea Level)	Maximum Power (60 Hz)
at/below 500 ft (152 m)	20,000 W (genset rating)
at 2500 ft (762 m)	18,600 W
at 5500 ft (1676 m)	16,500 W
above 5500 ft (1676 m)	16,500 W minus 700 W every 1000 ft (305 m)

TABLE 2-2. POWER VS. TEMPERATURE

Temperature	Maximum Power (60 Hz)
85° F (29.4° C)	20,000 W (genset rating)
95° F (35° C)	19,800 W
105° F (40.6° C)	19,600 W
122° F (50° C) or greater	19,260 W minus 200 W every 10° F (5.5° C)

TABLE 2-3. POWER VS TEMPERATURE AND ALTITUDE

Temperature and Altitude	Maximum Power (60 Hz)
85° F at/below 500 ft	20,000 W (genset rating)
95° F at 2500 ft	18,400 W
105° F at 2500 ft	18,200 W

RESETTING CIRCUIT BREAKERS

If a circuit breaker in the main power distribution panel of the vehicle or on the genset (Figure 2-2) trips, either a circuit shorted or too many appliances were running. Note that the genset will continue to run after a circuit breaker trips.

If a circuit breaker trips, disconnect or turn off as many loads as possible and reset the circuit breaker. (Push the circuit breaker to **OFF** to reset it and then to **ON** to reconnect the circuit.) If the circuit breaker trips right away, either the electrical distribution system has a short or the circuit breaker is faulty. Call a qualified electrician.

If the circuit breaker does not trip, reconnect the appliances, one by one, up to a total load that does not overload the genset or cause the circuit breaker to trip. If a circuit breaker trips right away when an appliance is connected, the appliance probably has a short.

Electrical appliances and tools must be used and maintained properly and be properly grounded to cause the line circuit breakers to trip when short circuits occur.

⚠WARNING ***Short circuits in electrical appliances and tools can cause fire and electrical shock leading to severe personal injury or death. Read and follow the equipment and tool manufacturer's instructions and warnings regarding use, maintenance and proper grounding.***

CONNECTING TO UTILITY POWER

A vehicle with provisions for connecting to utility power must have an approved device to keep the genset and utility from being interconnected. See the genset Installation Manual for more information.

⚠WARNING ***Interconnecting the genset and the public utility (or any other power source) can lead to electrocution of utility line workers, equipment damage and fire. Use an approved switching device to prevent interconnections.***

OPERATING IN COLD WEATHER

Make sure the engine oil viscosity is appropriate for the cold weather temperatures. See ENGINE OIL RECOMMENDATIONS (Page 2-1). Be sure to change the oil if a sudden drop in temperature occurs.

OPERATING IN HOT WEATHER

Pay particular attention to the following items when operating the genset in hot weather:

1. Make sure nothing blocks airflow to and from the genset.
2. Make sure engine oil viscosity is appropriate for the ambient temperatures. See ENGINE OIL RECOMMENDATIONS (Page 2-1).
3. Keep the genset clean.
4. Perform maintenance due. See PERIODIC MAINTENANCE SCHEDULE (Page 3-1).

OPERATING AT HIGH ALTITUDE

For the effect of altitude on maximum power, see LOADING THE GENSET (Page 2-4).

OPERATING IN DUSTY ENVIRONMENTS

Pay particular attention to the following items when operating the genset in dusty environments:

1. Do not let dirt and debris accumulate inside the genset compartment. Keep the genset clean.
2. Perform air cleaner maintenance more often. See PERIODIC MAINTENANCE SCHEDULE (Page 3-1).
3. Change engine oil more often. See PERIODIC MAINTENANCE SCHEDULE (Page 3-1).
4. Keep containers of engine oil that have been opened tightly closed to keep out dust.

BREAKING IN A NEW ENGINE

Proper engine break-in on a new genset or on one with a rebuilt engine is essential for top engine performance and acceptable oil consumption. Run the genset at approximately 1/2 rated power for the first 2 hours and then at 3/4 rated power for 2 more hours. See LOADING THE GENSET (Page 2-4).

Proper engine oil and oil level are especially critical during break-in because of the higher engine temperatures that can be expected. Change the oil if not appropriate for the ambient temperatures during break-in. See ENGINE OIL RECOMMENDATIONS (Page 2-1). Check oil level twice a day or every 4 hours during the first 24 hours of operation and change the oil and oil filter after the first 50 hours of operation.

EXERCISING THE GENSET

Exercise the genset at least 2 hours each month if use is infrequent. Run the genset at approximately 1/2 rated power. See LOADING THE GENSET (Page 2-4). A single two hour exercise period is better than several shorter periods.

Exercising a genset drives off moisture, re-lubricates the engine, replaces stale fuel and removes oxides from electrical contacts. The result is better starting, more reliable operation and longer engine life.

STORING THE GENSET

Proper storage is essential for preserving top genset performance and reliability when the genset cannot be exercised regularly and will be idle for more than 120 days.

Storing the Genset

1. Disable the automatic genset starting feature of an inverter-charger or other automatic starting device.

   ⚠WARNING ***CARBON MONOXIDE is deadly and can accumulate to dangerous levels in garages and other confined spaces. Disable the automatic genset starting feature of an inverter-charger or other automatic starting device before storing the vehicle.***

2. Push the genset line circuit breaker to OFF (Page 2-5).
3. Change the engine oil and attach a tag indicating oil viscosity. See ENGINE OIL RECOMMENDATIONS (Page 2-1).
4. Disconnect the battery cables (negative [–] cable first) from the starting battery and store the battery according to the battery manufacturer's recommendations. See MAINTAINING THE BATTERY AND BATTERY CONNECTIONS (Page 3-4).
5. Plug the exhaust tail pipe to keep out dirt, moisture, bugs, etc.
6. Close the fuel supply valve (if so equipped).

Returning the Genset to Service

1. Check the oil tag on the genset and change the oil if the viscosity indicated is not appropriate for the temperatures expected. See ENGINE OIL RECOMMENDATIONS (Page 2-1).

2. Reconnect the starting battery (negative [–] cable last). See MAINTAINING THE BATTERY AND BATTERY CONNECTIONS (Page 3-4).
3. Remove the plug from the exhaust tailpipe.
4. Replace the air filter element if it is dirty (Page 3-4).
5. Open the fuel supply valve (if so equipped).
6. Inspect the genset. See GENERAL INSPECTION (Page 3-2).
7. Push the genset line circuit breaker ON (Page 2-5) when the genset is ready to power appliances.
8. Enable the automatic genset starting feature of an inverter-charger or other automatic starting device following the device manufacturer's instructions and safety precautions.

THIS PAGE LEFT INTENTIONALLY BLANK

3. Periodic Maintenance

Periodic maintenance is essential for top performance and long genset life. Use Table 3-1 as a guide for normal periodic maintenance. In hot and dusty environments some maintenance procedures should be performed more frequently, as indicated by the footnotes in the table.

Maintenance, replacement or repair of emission control devices and systems may be performed by any engine repair establishment or individual. However, warranty work must be completed by an authorized Cummins Onan dealer.

⚠WARNING ***Accidental or remote starting can cause severe personal injury or death. Disconnect the negative (–) cable at the battery to prevent starting while working on the genset.***

TABLE 3-1. PERIODIC MAINTENANCE SCHEDULE

MAINTENANCE TASK	FREQUENCY								
	After First 50 Hrs	Every Day	Every Month	Every 250 Hrs	Every 500 Hrs	Every 800 Hrs	Every 1500 Hrs	Every 3000 Hrs	Page
General Inspection		•							3-2
Check Engine Oil Level		•							3-2
Check Engine Coolant Level		•							3-7
Check Battery & Battery Connections[1]			•						3-4
Change Engine Oil & Oil Filter[1, 2, 3, 8]	•				•				3-3
Clean Spark Arrestor[3]				•					3-5
Replace Engine Air Filter[2, 3]				•					3-4
Drain Water from Fuel Filter			•						3-6
Replace Fuel Filter[3]					•				3-6
Adjust Engine Valve Lash[6]						•			–
Flush Coolant System[4]							•		3-7
Replace Coolant Pressure Cap[4]							•		3-7
Check V-Belt & Coolant Hoses[5, 6] Replace as necessary				•					–
Check Fuel Injector Pressure[6, 7]							•		–
Replace Generator Bearing[6]								•	–

1. Perform more often when operating in hot weather.
2. Perform more often when operating in dusty conditions.
3. Perform at least once a year.
4. Perform at least once every two years.
5. Perform at least once every five years.
6. Must be performed by trained and experienced personnel (authorized Cummins Onan service representatives).
7. EPA requirement.
8. Perform every 75 hours when using high sulfur fuel. See ENGINE OIL RECOMMENDATIONS (Page 2-1).

GENERAL INSPECTION

Inspect the genset before the first start of the day and after every eight hours of operation.

Oil Level

Check engine oil level (Figure 3-1).

Engine Coolant System

⚠CAUTION ***Operating the genset when coolant level is low can cause serious engine damage.***

Check the engine coolant level and look for coolant leaks around the bottom of the genset and on the ground below. Minor leaks that can be replenished by daily additions of coolant to the recovery tank should be repaired by a qualified service technician as soon as possible. Larger leaks are cause for shutting down the genset until it can be repaired.

Exhaust System

⚠WARNING ***EXHAUST GAS IS DEADLY! Do not operate the genset if there is an exhaust leak or any danger of exhaust gases entering or being drawn into the vehicle.***

Look and listen for exhaust system leaks while the genset is running. Shut down the genset if a leak is found and have it repaired before operating the genset again.

Look for openings or holes between the genset compartment and vehicle cab or living space if the genset engine sounds louder than usual. Have all such openings or holes closed off or sealed to prevent exhaust gases from entering the vehicle.

Replace dented, bent or severely rusted sections of the tailpipe and make sure the tailpipe extends at least 1 inch (25.4 mm) beyond the perimeter of the vehicle.

⚠WARNING ***Do not park the vehicle in high grass or brush. Contact with the exhaust system can cause a fire.***

Park the vehicle so that the genset exhaust gases can disperse away from the vehicle. Barriers such as walls, snow banks, high grass and brush and other vehicles can cause exhaust gases to accumulate in and around the vehicle.

Do not operate power ventilators or exhaust fans while the vehicle is standing with the genset running. The ventilator or fan can draw exhaust gases into the vehicle.

Fuel System

Check for leaks at hose, tube and pipe fittings in the fuel supply system while the genset is running and while it is stopped. Check flexible fuel hose sections for cuts, cracks, and abrasions. Make sure the fuel line is not rubbing against other parts. Replace worn or damaged fuel line parts before leaks occur.

⚠WARNING ***Diesel fuel leaks can lead to fire. Do not operate the genset if operation causes fuel to leak.***

Prime the fuel system if the genset ran out of fuel.

Battery Connections

Check the battery terminals for clean, tight connections. Loose or corroded connections have high electrical resistance which makes starting more difficult. See MAINTAINING THE BATTERY AND BATTERY CONNECTIONS (p. 3-4).

Mechanical

Look for mechanical damage and listen for unusual noises. Check the genset mounting bolts for any signs of wear.

To prevent overheating and to reduce fouling with dust and debris, make sure the genset's normal ground clearance is not being reduced by sloping ground, curbs, logs or other objects. Repark the vehicle if necessary and/or remove any objects blocking the air inlet or air outlet.

CHECKING ENGINE OIL LEVEL

⚠WARNING ***State and federal agencies have determined that contact with used engine oil can cause cancer or reproductive toxicity. Avoid skin contact and breathing of vapors. Use rubber gloves and wash exposed skin.***

1. Park the vehicle on level ground, and shut down the genset.
2. Pull out the oil dip stick, wipe it clean, reinsert it and pull it out again to check the oil level (Figure 3-1).

3. Add or drain oil as necessary. See ENGINE OIL RECOMMENDATIONS (p. 2-1). Keep the oil level between the FULL and ADD marks.

   ⚠CAUTION ***Too much oil can cause high oil consumption. Too little oil can cause severe engine damage. Keep the oil level between the FULL and ADD marks.***

4. Reinsert the dipstick and secure the oil fill cap.

CHANGING ENGINE OIL AND OIL FILTER

Refer to Table 3-1 for scheduled engine oil change. Change oil more often in hot and dusty environments.

1. Run the genset until warm and shut it off.
2. Remove the oil fill cap, and disconnect the oil drain hose. Then, open the oil drain valve, or remove the plug from the oil pan (according to your generator set). Finally, drain all the oil from the engine into a suitable container. ***Reinstall the oil drain hose securely, and close the oil drain valve or reinsert the oil drain plug*** (Figure 3-1).
3. Spin off the oil filter canister and clean the filter mounting surface on the engine block. Remove the old gasket if it remains.
4. Make sure the gasket is in place on the new filter and apply a thin film of clean oil to the gasket. Spin the new filter on until the gasket just touches the block. Turn it an additional 1/2 to 3/4 turn. Do not overtighten.
5. Refill with 10 quarts (9.5 liters) of oil, check oil level (Figure 3-1).
6. Dispose of the used oil and oil filter according to local environmental regulations.

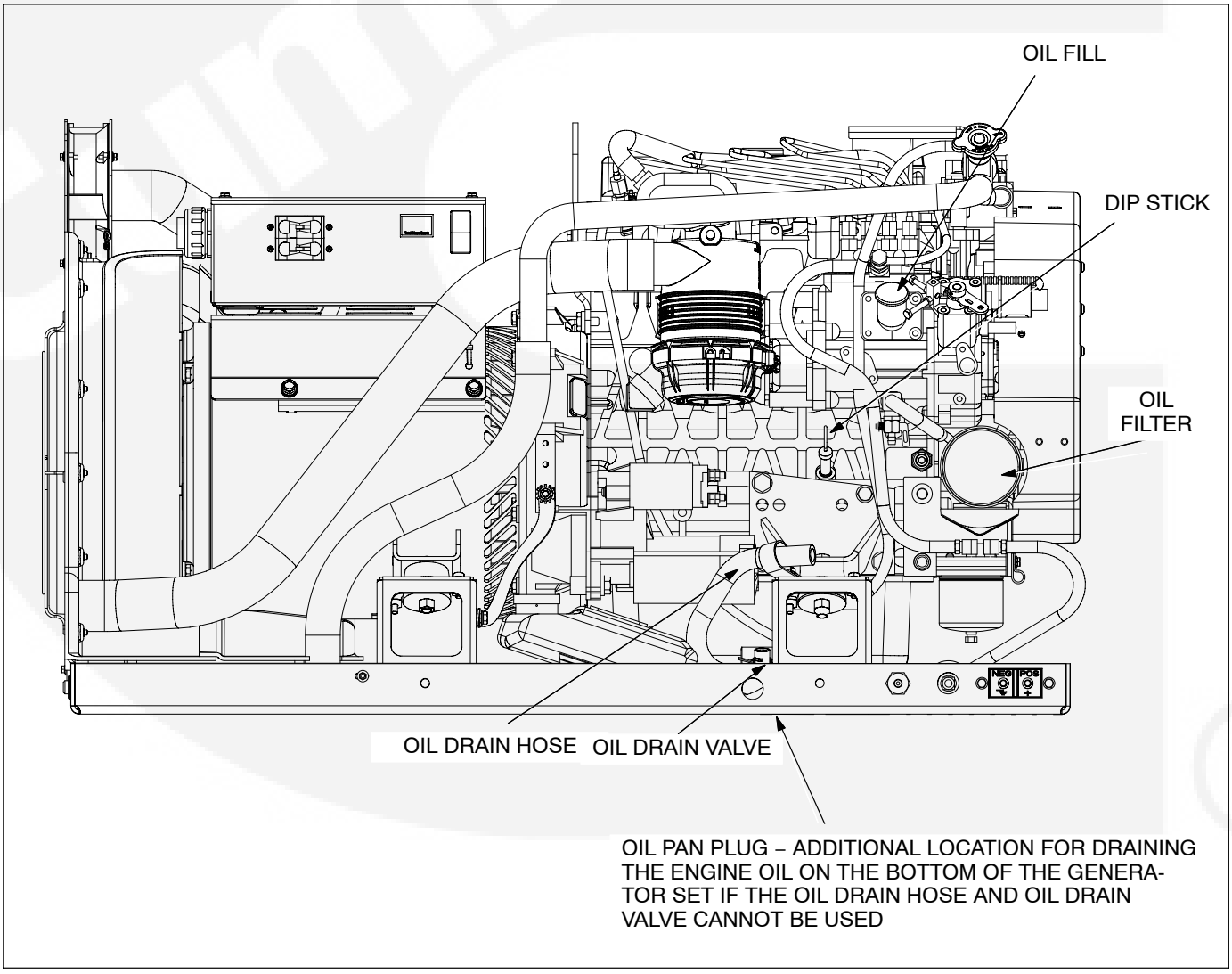
OIL FILL
DIP STICK
OIL FILTER
OIL DRAIN HOSE
OIL DRAIN VALVE
OIL PAN PLUG – ADDITIONAL LOCATION FOR DRAINING THE ENGINE OIL ON THE BOTTOM OF THE GENERATOR SET IF THE OIL DRAIN HOSE AND OIL DRAIN VALVE CANNOT BE USED

FIGURE 3-1. ENGINE OIL MAINTENANCE

MAINTAINING THE BATTERY AND BATTERY CONNECTIONS

⚠WARNING ***Arcing at battery terminals or in light switches or other equipment, and flames or sparks, can ignite battery gas causing severe personal injury—Ventilate battery area before working on or near battery—Wear safety glasses—Do not smoke—Switch work light ON or OFF away from battery—Stop genset and disconnect charger before disconnecting battery cables—Disconnect negative (–) cable first and reconnect last.***

Refer to Table 3-1 for scheduled battery maintenance, and follow the battery manufacturer's instructions. Have the battery charging system serviced if DC system voltage is consistently low or high. Always:

1. Keep the battery case and terminals clean and dry and the terminals tight.
2. Remove battery cables with a battery terminal puller.
3. Make sure which terminal is positive (+) and which is negative (–) before making battery connections, always removing the negative (–) cable first and reconnecting it last to reduce arcing.

REPLACING THE AIR FILTER ELEMENT

Refer to Table 3-1 for scheduled air filter replacement. Replace it more often in dusty environments. The air filter is located on the side of the engine as shown in Figure 3-2.

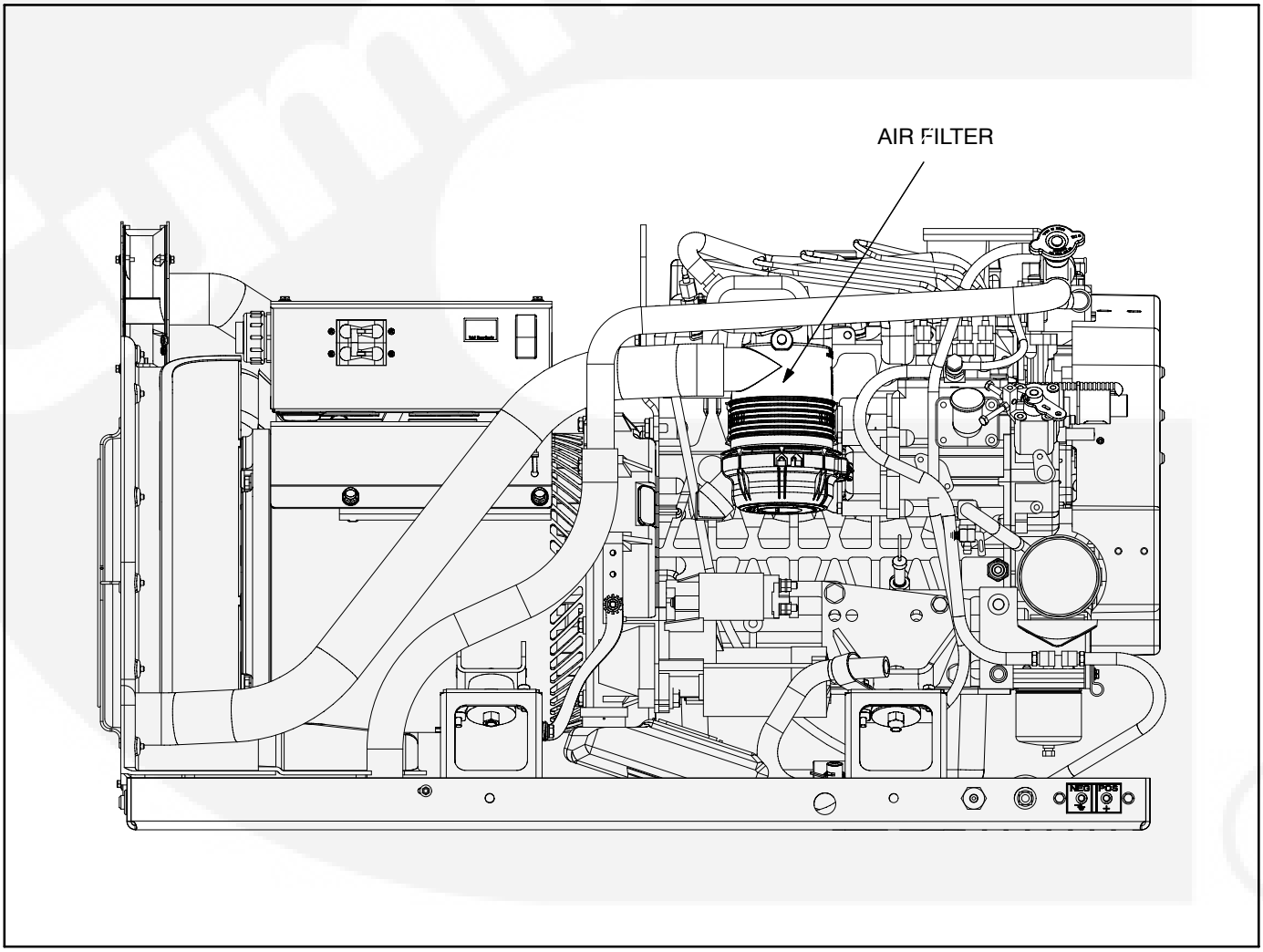

FIGURE 3-2. REPLACING THE AIR FILTER ELEMENT

CLEANING THE SPARK ARRESTOR

Refer to Table 3-1 for scheduled cleaning of the spark arrestor (which meets U.S. Forest Service requirements). Cleaning is required for maximum genset performance.

⚠WARNING ***A hot muffler can cause severe burns. Let the muffler cool down before removing or installing the cleanout plug.***

The spark arrestor cleanout plug is located on the side of the muffler (Figure 3-3). Clean out the spark arrestor as follows:

1. Remove the 1/4" NPT cleanout plug from the muffler.
2. Start the genset and load it nearly to full power. Let the genset run for about five minutes to expel the soot.
3. Stop the genset, allow the muffler to cool down, reinstall the cleanout plug.

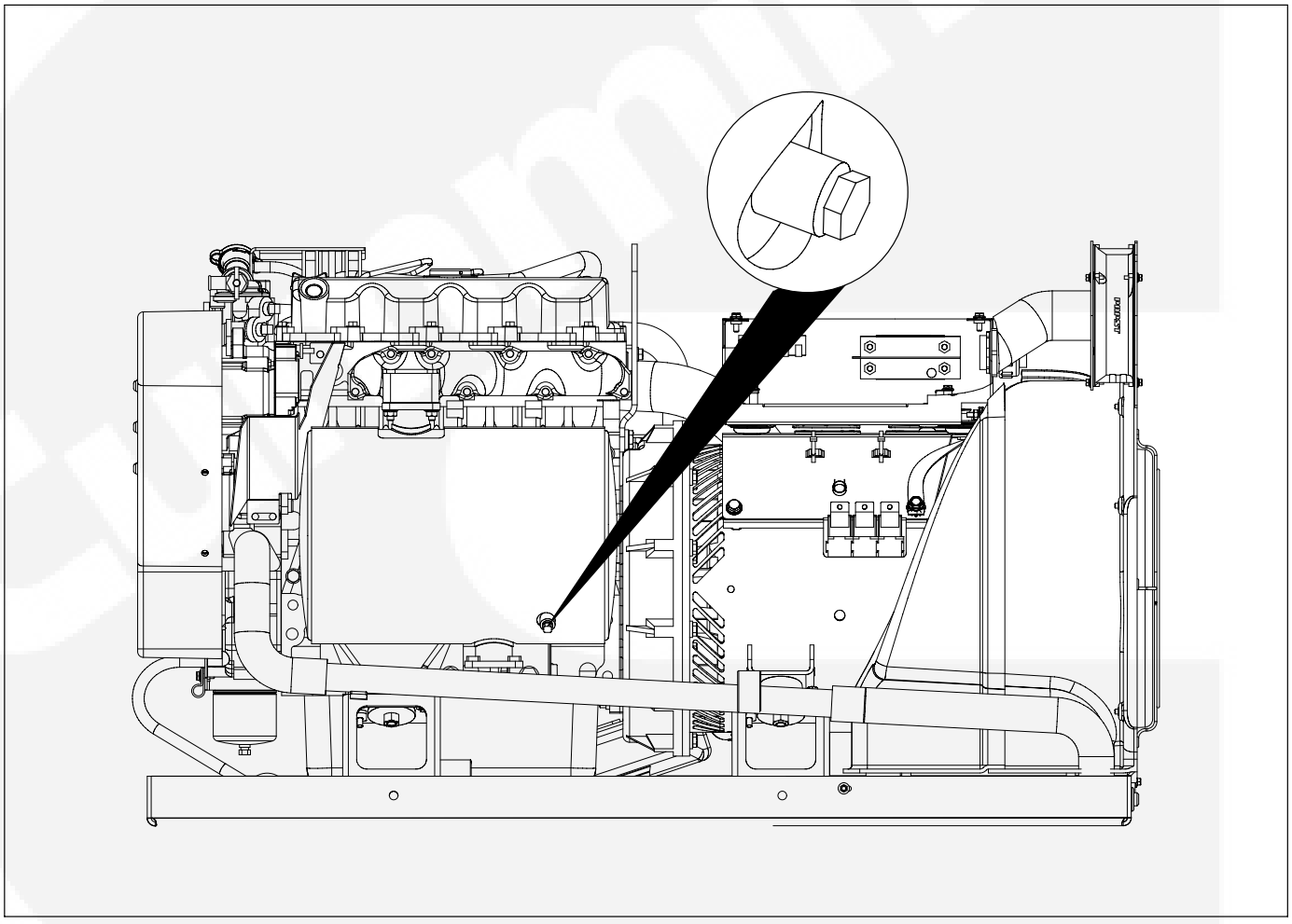

FIGURE 3-3. SPARK ARRESTOR CLEANOUT PLUG

DRAINING/REPLACING THE FUEL FILTER

⚠WARNING ***Diesel fuel is combustible and can cause severe personal injury or death. Do not smoke near diesel fuel tanks or equipment. Keep flames, sparks, pilot lights, electrical switches, arc-producing equipment and all other sources of ignition well away. Keep a type ABC fire extinguisher in the vehicle.***

Close any fuel line shutoff valve before disconnecting the fuel line from the filter.

Accidental or remote starting can cause severe personal injury or death. Disconnect the negative (–) cable at the battery to prevent starting while working on the genset.

Keep dirt, water and other contaminants from entering the fuel system and corroding or clogging fuel injection components.

Draining Water and Sediment

The generator set may have a water-separator type of fuel filter (Figure 3-4). Also check for upstream water-separator type fuel filters. Drain water and sediment more often than scheduled if fuel quality is poor or condensation cannot be avoided. Dispose of the water, sediment and fuel drained off in accordance with local environmental regulations.

Replacing the Fuel Filter

See Table 3-1 for scheduled fuel filter replacement. Replace the fuel filter if the engine lacks power.

1. Disconnect the negative (–) cable at the battery to prevent the engine from starting, and close any fuel supply and return valves.

⚠WARNING ***Accidental or remote starting can cause severe personal injury or death. Disconnect the negative (–) cable at the battery to prevent the engine from starting.***

2. Spin off the old filter with a filter wrench, and dispose of it in accordance with local environmental regulations.
3. Clean the contact surface on the filter base, lubricate the new filter gasket, and spin the new filter on hand tight.
4. Prime the engine for at least 30 seconds to fill the new filter (Page 2-3). Run the generator set and check for leaks. Tighten the filter by hand, if necessary.

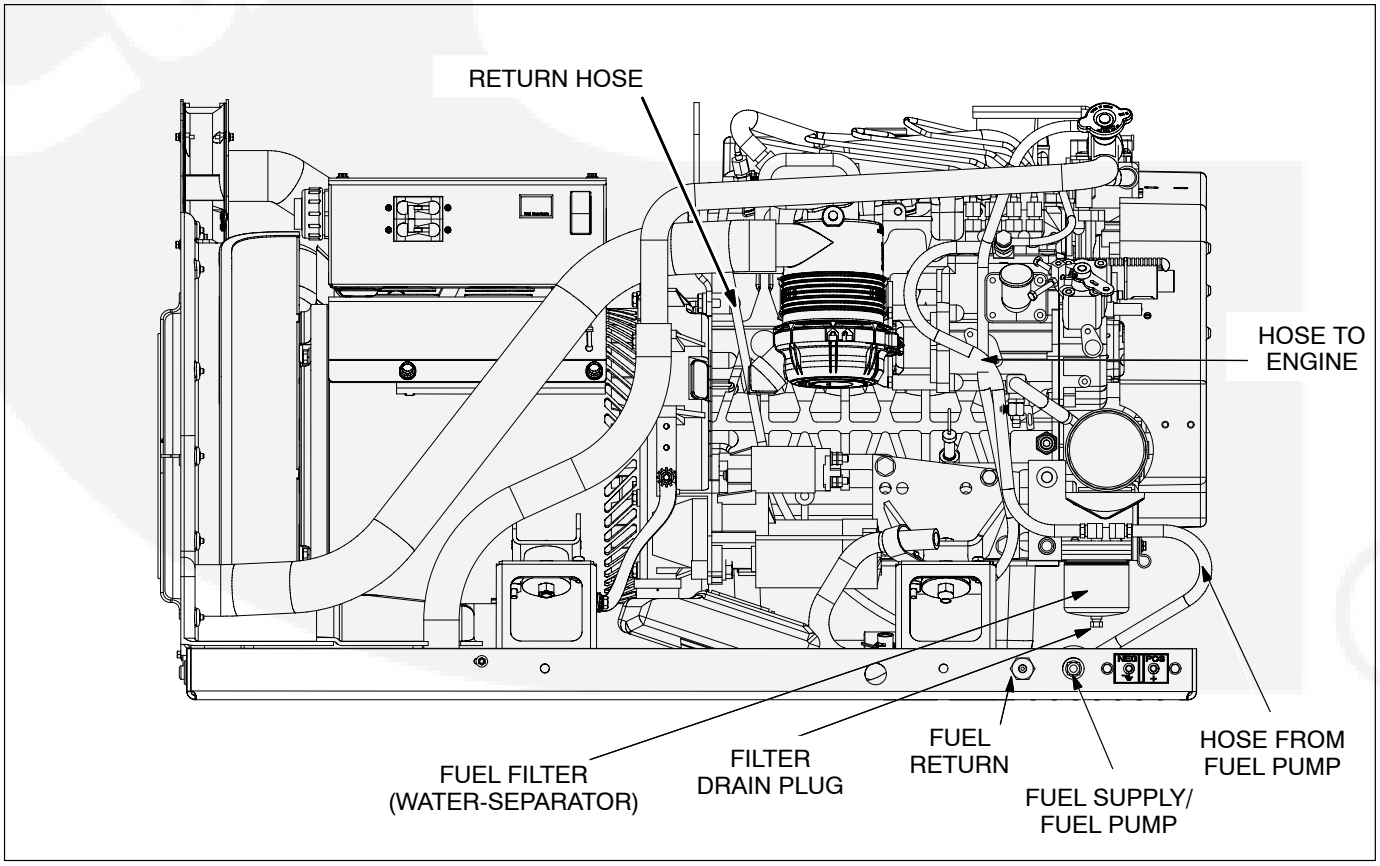

FIGURE 3-4. FUEL FILTER

MAINTAINING THE ENGINE COOLING SYSTEM

Refer to Table 3-1 for scheduled maintenance. The engine cooling system is filled at the factory with a 50/50 mixture of ethylene glycol anti-freeze and water, which is suitable for temperatures down to -34° F (-37° C).

Recommended Coolant

See COOLANT RECOMMENDATIONS (p. 2-2).

Pressure Cap

Replace the pressure cap (Figure 3-5) every two years (seals deteriorate and leak). Proper cooling system pressure (13 psi) is essential for optimal engine cooling and minimal coolant loss.

Draining and Cleaning Cooling System

⚠WARNING ***Hot coolant spray can cause severe burns. Let the engine cool before releasing the pressure cap or removing the drain plug.***

Accidental or remote starting can cause severe personal injury or death. Disconnect the negative (–) cable at the battery to prevent starting while working on the genset.

Let the engine cool before removing the pressure cap. Relieve any remaining pressure by turning the pressure cap slowly, without pushing down. When the pressure has been relieved, push down on the cap, turn it the rest of the way and withdraw it. Then remove the coolant drain plug (Figure 3-5) and drain the coolant into a suitable container.

⚠WARNING ***Ethylene glycol antifreeze is considered toxic. Dispose of it according to local regulations for hazardous substances.***

Flush and clean the cooling system before refilling. Radiator cleaning chemicals are available at local auto parts stores. Follow the instructions for cleaning and flushing that come with the cleaning solution.

Refilling Cooling System

Install the coolant drain plug in the radiator *using pipe thread sealant*. Tighten it just enough so that it does not leak when the genset is running and has warmed up.

Open the air bleed valve located in the engine thermostat housing. Fill the system using a funnel to prevent coolant from entering the overflow bottle hose. Once coolant begins to bleed out of the air bleed valve, close the air bleed valve and add coolant until it reaches the fill opening. Also, fill the recovery tank to the COLD mark, then install the pressure cap. Add more coolant if necessary after the generator set has run for a few minutes.

Coolant Level Check

Check coolant level in the recovery tank (Figure 3-5) before the first startup of each day and fill to the COLD mark if necessary with Recommended Coolant.

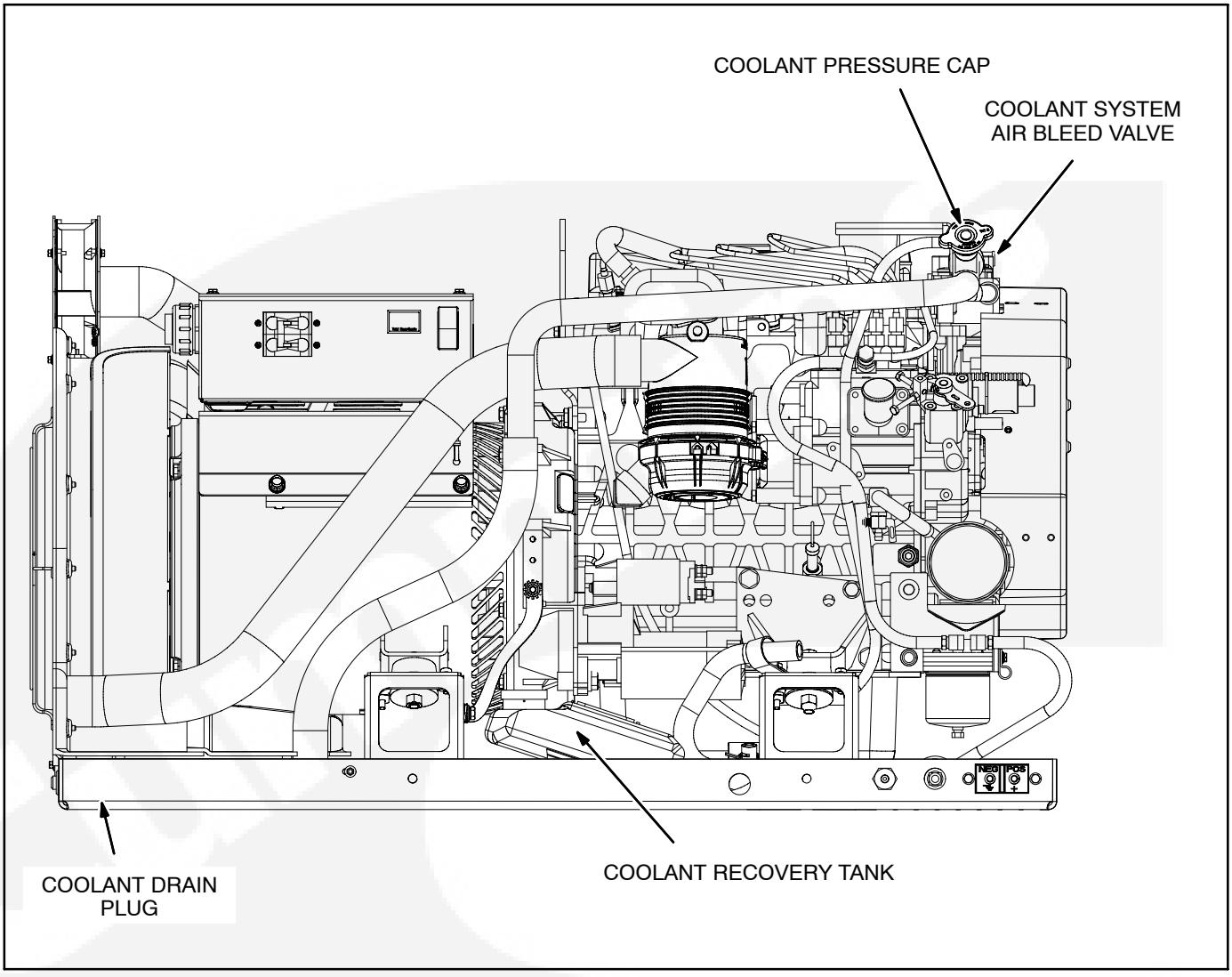

FIGURE 3-5. ENGINE COOLING SYSTEM

4. Troubleshooting

TROUBLESHOOTING WITH TABLE 4-1

To aid troubleshooting the genset controller causes the status indicator light to blink the numeric code assigned to the fault that caused shutdown. For a brief description of the fault and step-by-step corrective action, refer to TABLE 4-1. TROUBLESHOOTING, which lists the fault codes in numerical order.

If you are unable to resolve the problem after taking the corrective actions suggested, contact an authorized Cummins Onan dealer. See HOW TO OBTAIN SERVICE (p. 1-2).

Note: Many genset shutdowns can be avoided by performing periodic maintenance on schedule (TABLE 3-1. PERIODIC MAINTENANCE SCHEDULE) and by *not* running the genset out of fuel. Note that when the genset and propulsion engine draw from the same fuel tank, the fuel dip tubes are usually arranged so that the genset will run out of fuel first. By marking the genset empty point on the fuel gauge, it will be easier to tell when the genset may run out of fuel.

FAULT CODE BLINKING

At fault shutdown, the status indicator light will repeatedly blink sets of 1, 2, 3 or 4 blinks.

- **One blink** indicates shutdown due to high engine coolant temperature.
- **Two blinks** indicate shutdown due to a loss of engine oil pressure.
- **Three blinks** indicate a service fault. Press **Stop** once to cause the two-digit, second-level shutdown code to blink. (Pressing **Stop** again will stop the blinking.) The two-digit code consists of 1, 2, 3, 4 or 5 blinks, a brief pause, and then 1 to 9 blinks. The first set of blinks represents the tens digit and the second set of blinks the units digit of the shutdown code number. For example, **shutdown code No. 36** appears as:

  blink-blink-blink—*pause*—blink-blink-blink-blink-blink-blink—*long pause*—repeat

- **Four blinks** indicate that cranking time exceeded 35 seconds.
- *To avoid the possibility of anyone misinterpreting Code Nos. 3 and 4 as Code Nos. 33 and 44, the latter have not been assigned faults.*

RESTORING FAULT CODE BLINKING

Blinking continues for five minutes and stops. To restore blinking press the control switch to **STOP (Prime)** until the light comes on (3 to 4 seconds). Then press **STOP (Prime)** three times to restores blinking.

Note: The last fault logged will blink even though the condition that caused the shutdown may have been corrected.

TABLE 4-1. TROUBLESHOOTING

⚠WARNING ***Some genset service procedures present hazards that can result in severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform genset service. See Safety Precautions.***

NO RESPONSE AT CONTROL SWITCH

(Faulty switch, poor or missing connections, dead battery)

Corrective Action:

1. Try the genset (local) control switch if there is no response at the remote control switch, and vice versa.
2. Check for 12 VDC across genset battery cable terminal block. Service as necessary by cleaning and tightening battery cable connections, recharging or replacing the battery or replacing damaged or missing battery cables.

THE STARTER ENGAGES AND DISENGAGES

(Low cranking voltage)

Corrective Action:

1. Have the vehicle propulsion engine running while trying to start the genset. Its charging alternator may be able to maintain a high enough battery terminal voltage to start the genset.
2. Service the battery as necessary by cleaning and tightening connections, recharging or replacing the battery or replacing damaged battery cables.

THE STARTING BATTERIES DO NOT MAINTAIN A CHARGE

(Marginal battery, battery connections or charging system)

Corrective Action:

1. Service the battery as necessary by cleaning and tightening connections, recharging or replacing the battery or replacing damaged battery cables.
2. Have the battery recharging system serviced.

NO AC POWER WHEN GENSET IS RUNNING

(A Circuit Breaker is OFF, tripped or malfunctioning or there are poor AC harness connections)

Corrective Action:

1. Reset or turn ON genset circuit breaker **CB1**.
2. Reset or turn ON any other circuit breaker in the AC power supply system.

PERSISTENT, AUDIBLE ENGINE SURGING—WITHOUT FAULT SHUTDOWN

(Fuel leaks, restrictions or air bubbles, worn slip rings/brushes, misadjusted or faulty governor, worn generator bearing)

Corrective Action:

1. Check all fuel fittings for fuel and air leaks and tighten as necessary. Reprime.
2. Replace the fuel filter (p. 3-6).

TABLE 4-1. TROUBLESHOOTING

⚠WARNING ***Some genset service procedures present hazards that can result in severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform genset service. See Safety Precautions.***

ENGINE OVER TEMPERATURE—CODE NO. 1

(During normal operation engine coolant temperature exceeded 239° F [115° C] for 10 seconds)

Corrective Action:

1. Check engine coolant level, add coolant as necessary and repair any leaks.
2. Check for and remove any objects blocking the air inlet or outlet openings in the bottom of the genset and clean out dirt fouling the radiator passages.
3. Run fewer appliances at the same time to keep down engine temperature. (Note that high altitude and high ambient temperature decrease engine cooling capacity.)

LOW OIL PRESSURE—CODE NO. 2

(During normal operation engine oil pressure dropped to less than 14 psi [97 kPa] for 3 seconds—switch closed)

Corrective Action:

1. Check engine oil level, add oil as necessary and repair any leaks.
2. Drain the excess oil if the level is above Full on the dipstick. If the level is too high the crankshaft can whip the oil into foam, which the pump can't pump.)

SERVICE CHECK—CODE NO. 3

(A second-level fault occurred)

Corrective Action: Check the second-level fault code by momentarily pressing Stop. The second-level fault will be one of the following in this table.

OVER CRANK—CODE NO. 4

(First-level fault code—Cranking time exceeded 35 seconds)

Corrective Action:

1. Check fuel level and refill as necessary. (Note: The genset fuel pickup is probably higher than the vehicle engine fuel pickup.)
2. Prime the engine fuel system for one minute (p. 2-3).
3. Check the engine air filter and remove any blockage (p. 3-4).
4. Change the engine oil to oil of the proper viscosity for the ambient temperature. High oil viscosity can slow down cranking speed.
5. Check all fuel fittings for fuel and air leaks and tighten as necessary. Reprime.
6. Replace the fuel filter (p. 3-6).

OVER VOLTAGE—CODE NO. 12

(After voltage regulation was enabled Output Voltage jumped to more than 125% of rated for 75 milliseconds or to more than 115% of rated for 3 seconds)

Corrective Action: See an authorized Cummins Onan dealer.

TABLE 4-1. TROUBLESHOOTING

⚠WARNING ***Some genset service procedures present hazards that can result in severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform genset service. See Safety Precautions.***

UNDER VOLTAGE—CODE NO. 13

(After voltage regulation was enabled Output Voltage fell to less than 90% of rated for 5 seconds)

Corrective Action: Turn OFF the line circuit breaker on the operator's console. If the genset now runs, run it with fewer connected loads.

OVER FREQUENCY—CODE NO. 14

(After the starter was engaged Frequency jumped to more than 70 Hz for 40 milliseconds, or to more than 66 Hz for 6 seconds)

Corrective Action:

1. Check for a tripped genset circuit breaker, reset it if necessary, and run with fewer connected loads. (A breaker tripping under load can cause genset frequency to overshoot.)
2. Check all fuel fittings for fuel and air leaks and tighten as necessary. Reprime. (Air bubbles can disrupt frequency.)

UNDER FREQUENCY—CODE NO. 15

(During normal operation Frequency fell to less than 54 Hz for more than 8 seconds)

Corrective Action:

1. Push the line circuit breaker to OFF and restart the genset. If the genset now runs, run it with fewer connected loads, especially those with high motor starting loads such as air conditioners.
2. Check all fuel fittings for fuel and air leaks and tighten as necessary. Reprime. (Air bubbles can disrupt frequency.)
3. Replace the engine air filter and clean the spark-arrest muffler (p. 3-4).
4. Replace the fuel filter (p. 3-6).

ACTUATOR SHORTED OR OPEN—CODE NO. 19

(At startup the Controller sensed an open or shorted governor actuator/harness)

Corrective Action: See an authorized Cummins Onan dealer.

ACTUATOR OVERLOAD—CODE NO. 22

(Due to connected overload or low engine performance, the Controller maintained the governor actuator at full-duty cycle—maximum pulse-width-modulated square-wave signal [PWM]—for 60 consecutive seconds)

Corrective Action:

1. Reduce the number of appliances running at the same time, especially those with high motor starting loads such as air conditioners.
2. Check all fuel fittings for fuel and air leaks and tighten as necessary. Reprime.
3. Replace the engine air filter and clean the spark-arrest muffler (p. 3-4).
4. Replace the fuel filter (p. 3-6).

TABLE 4-1. TROUBLESHOOTING

⚠WARNING ***Some genset service procedures present hazards that can result in severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform genset service. See Safety Precautions.***

VAC SENSE LOST—CODE NO. 27

(The Controller lost VAC sensing during normal voltage regulation when the field was functioning normally and frequency was at least 40 Hz)

Corrective Action: See an authorized Cummins Onan dealer.

HIGH BATTERY VOLTAGE—CODE NO. 29

(During startup the Controller sensed that battery system voltage was greater than 19.2 volts for 5 milliseconds or greater than 19.2 volts for 1 second will running)

Corrective Action:

1. Check battery bank connections and reconnect if necessary so that the 12 volt batteries serving the genset are connected in parallel (12 volt) rather than in series (24 volt).
2. Select a lower battery booster charge rate.

STARTING FAULT—CODE NO. 32

(The Controller could not detect cranking speed [quadrature zero crossings] for 12 seconds)

Corrective Action:

1. Have the vehicle propulsion engine running while trying to start the genset. Its charging alternator may be able to maintain a high enough battery terminal voltage to start the genset.
2. Service the battery as necessary by cleaning and tightening connections, recharging or replacing the battery or replacing damaged battery cables.
3. Change the engine oil to oil of the proper viscosity for the ambient temperature. High oil viscosity can slow down cranking speed.

EE CHECKSUM FAULT—CODE NO. 35

(During startup the genset Controller detected an EE memory error)

Corrective Action: See an authorized Cummins Onan dealer.

MECHANICAL FAULT—CODE NO. 36

(The Controller declared this fault because engine speed fell below 1000 RPM for 0.5 seconds, though not by Controller action)

Corrective Action:

1. Check fuel level and refill as necessary. (Note: The genset fuel pickup is probably higher than the vehicle engine fuel pickup.)
2. Prime the engine fuel system for one minute (p. 2-3).
3. Check all fuel fittings for fuel and air leaks and tighten as necessary. Reprime.
4. Check the engine air filter and remove any blockage (p. 3-4).
5. Replace the fuel filter (p. 3-6).

TABLE 4-1. TROUBLESHOOTING

⚠WARNING ***Some genset service procedures present hazards that can result in severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform genset service. See Safety Precautions.***

FIELD OVERLOAD—CODE NO. 38

(During normal voltage regulation Quad Voltage exceeded 150 VAC for 10 seconds)

Corrective Action:

1. Reduce the number of air conditioners running at the same time, and other appliances that cause low power factor. (The lower the power factor of a motor or compressor, the more current it draws per kilowatt. The genset Controller, in turn, must boost field voltage to meet the higher demand for current imposed by low power factor.)
2. Have the air conditioners and other appliances checked for proper operation. (A locked compressor rotor can cause a very low power factor.)

RAM FAULT—CODE NO. 43

(During startup the genset Controller detected a RAM memory error)

Corrective Action: See an authorized Cummins Onan dealer.

SPEED SENSE LOST—CODE NO. 45

(After start disconnect the Controller lost speed sense [quadrature zero crossings] for 0.25 seconds)

Corrective Action: See an authorized Cummins Onan dealer.

OVERPRIME—CODE NO. 57

(The local or remote control switch was held in the Prime position for more than 3 minutes)

Corrective Action: Check for and remove any object that may be holding either control switch (remote or local) in the prime position.

COMPARTMENT OVERTEMP––CODE NO. 76

(During operation, the temperature inside the compartment has reached 180° F [82° C]. The air temperature switch will reset at 165° F [74° C].)

Corrective Action:

1. Check the connections of the air temperature switch.
2. Check to make sure the inlet to the remote fan is not blocked.
3. Check to make sure the compartment cutout for cooling air exhaust is not obstructed.

5. Specifications

⚠ CAUTION ***Do not convert the generator set from 60 Hz to 50 Hz. Attempting to do so will damage the equipment.***

MODEL:	**HDKAW**
GENERATOR SET CONTROL: Integrated Microprocessor-Based Engine and Generator Controller	
GENERATOR: Single-Bearing, 4-Pole Rotating Field	
Power (@1.0 power factor)	20,000 W
Voltage	120 / 240
Frequency	60 Hz
Number of Phases	1
Current	83.3 amps per leg
Line Circuit Breaker	2-pole, 85 amp
FUEL CONSUMPTION:	
No-load Half-load Full-load	0.54 gph (2.04 lph) 1.12 gph (4.24 lph) 1.95 gph (7.39 lph)
ENGINE: 4-Cylinder In-Line, Water-Cooled, Indirect-Injection (IDI), 4-Stroke Cycle Diesel	
Bore	3.43 in (87 mm)
Stroke	4.03 in (102.4 mm)
Displacement	148.53 in^3 (2,434 cc)
Compression Ratio	24.3 : 1
Fuel Injection Timing (BTDC)	13.5° – 15°
Firing Order (Clockwise Rotation)	1–3–4–2
Fuel Nozzle Injection Pressure	1991 psi (13.73 MPa)
Cylinder Compression Test	370 psi (2.55 MPa) minimum
Valve Lash: Intake & Exhaust (cold)	0.0071 to 0.0087 in (0.18 to 0.22 mm)
Oil Capacity (with filter)	10 quart (9.5 liter)
Cooling System Capacity	7.8 quart (7.4 liter)
DC SYSTEM:	
Nominal Battery Voltage	12 volts
Minimum Battery Capacity CCA (Cold Cranking Amps)	650 amps down to 0° F (–17° C) 875 amps down to –10° F (–23° C) 1000+ amps down to –20° F (–29° C)
Maximum Regulated Charging Current	40 amps
WEIGHT:	890 lbs (404 kg)
SIZE (L x W x H): 48.9 x 23.6 x 29.7 in (1241 x 600 x 708 mm)	

MODEL:	HDKAW
SOUND LEVEL:	
60 Hertz Models	81.9 dB(A) @ 10 ft (3m) before installation @ full load
50 Hertz Models	79.4 dB(A) @ 10 ft (3m) before installation @ full load

6. Maintenance Record

Record all periodic and unscheduled maintenance and service. See *Section 3. Periodic Maintenance.*

DATE	HOUR METER READING	MAINTENANCE OR SERVICE PERFORMED

Record the name, address, and phone number of your authorized Cummins Onan service center.

THIS PAGE LEFT INTENTIONALLY BLANK

Cummins **Onan**

Cummins Power Generation
1400 73rd Ave. NE
Minneapolis, MN 55432 USA

Phone 1 763 574 5000
Toll-free 1 800 888 6626
Fax 1 763 574 5298
Email www.cumminsonan.com/contact
www.cumminsonan.com

Cummins®, Onan®, the "C" logo, and "Performance you rely on." are trademarks of Cummins Inc.

©2009 Cummins Power Generation, Inc. All rights reserved.